Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Transition from TTY to Real-Time Text Technology	)	CG Docket No. 16-145
	)	
	)	
Petition for Rulemaking to Update the Commission's Rules for Access to Support the Transition from TTY to Real-Time Text Technology, and Petition for Waiver of Rules Requiring Support of TTY Technology	)	GN Docket No. 15-178

COMMENTS OF
Rehabilitation Engineering Research Center on Tech. for the Deaf and Hard of Hearing
Rehabilitation Engineering Research Center on Universal Interface and IT Access
Omnitor
Telecommunications for the Deaf and Hard of Hearing, Inc.
National Association of the Deaf
Hearing Loss Association of America

Rehabilitation Engineering Research Center on Technology for the Deaf and Hard of Hearing (DHH-RERC), Rehabilitation Engineering Research Center on Universal Interface and IT Access (UIITA-RERC), and Omnitor (collectively, "RERCs and Omnitor"), and Telecommunications for the Deaf and Hard of Hearing, Inc., National Association of the Deaf, and Hearing Loss Association of America (collectively, "Consumer Groups"), respectfully submit these comments in response to the Federal Communications Commission's ("FCC" or Commission") December 15, 2016 Further Notice of Proposed Rulemaking in the above-captioned proceedings ("FNPRM").[1]

[1] *Transition from TTY to Real-Time Text Technology*, Report and Order and Further Notice of Proposed Rulemaking, FCC 16-196, CG Docket No. 16-145, GN Docket No. 15-178 (Dec. 16, 2016) ("FNPRM").

TABLE OF CONTENTS

I. Introduction and Summary

We commend the FCC for its December 15, 2016 Report and Order regarding real-time text, which allows wireless carriers to provide support for accessible, conversational services in a modern and functional way.[2] We also commend the Commission for identifying and confronting some of the remaining challenges regarding RTT implementation, as outlined in the FNPRM.

In these comments, we reiterate that TTY interoperability requirements should not sunset as long as there are areas where the only way to carry out a text based emergency call is by TTY. We also outline key metrics regarding the deployment rate of RTT and the need for backward compatibility, including the number of calls using text transmission between RTT and TTY, information concerning RTT support in the network, and a comparison of the number of provided handset models with and without RTT support. We caution that setting a specific sunset date for backward compatibility at this time is premature, as there can be no assurances of how the RTT landscape will look at a specific date in the future. It therefore makes more sense to sunset interoperability requirements when the infrastructure has completely migrated to IP-based signalling.

We also stress that an important factor in RTT supplanting TTYs is ensuring that all users, including those who are accustomed to TTY but not mobile devices, are able to use RTT. This is especially critical for older adults and people with intellectual disabilities that may prevent them from learning a new, unfamiliar, and more complex user interface than what the

[2] We offer for the Commission's consideration one technical clarification to the Order. In §67.2 (ii)(b)(2), the word "internetworking" should be replaced with "interoperability." "Internetworking" means connecting IP networks so that they interoperate as a common IP network. In the RTT/TTY context, "interoperability" is a matter of communication between an application (RTT) on an IP network and another application (TTY) on a network that may be circuit switched or use other technologies. The term "internetworking" might lead to some confusion when interpreting the rule.

TTY offers. An important part of ensuring that RTT is accessible to these populations is enabling wireline users to utilize RTT.

We cannot emphasize strongly enough the importance of integrating RTT into TRS. While RTT to RTT calls can reduce the load on TRS for cases where both users can conveniently operate RTT in their current situation, there still will be situations where one party in the call will only have the option to use voice or sign language and the other only RTT, and therefore a TRS service will be needed to mediate the call. Whatever approach the Commission takes toward a mandated versus voluntary approach to providing RTT in the TRS ecosystem, it is critical that the decision allows clear functional requirements for TRS to be placed on carriers and TRS providers. We reiterate that RTT should not be considered a replacement for TRS, and that it is important for users of non-text-based TRS to continue to have access to these important services. We also stress that integrating RTT into the TRS ecosystem necessitates mindfulness of emergency calling issues.

There are important factors that could serve as minimum standards for RTT-based TRS, and initially, a model like the current 711 calling model could be used while TRS providers implement a call routing architecture that supports both RTT for direct calls and RTT through TRS. However, the most desirable model for RTT-based TRS is one where users make and receive calls directly from their number in one step. We recommend an architecture where the RTT-based TRS user initiates and receives the call directly to or from the other party in the call and the user has an opportunity to indicate if a relay service is needed in the call, and if so, the terminal takes the necessary actions to invoke the TRS on one leg of a three-party call. We also wish to emphasize that all forms of TRS need to take steps to ensure RTT support in both their networks and terminals, and that it should be based on the RFC 4103 safe harbor standard. In all

TRS use cases, we strongly encourage making RTT available to all parties in the conversation where supported by the networks and terminal, and not restricting it to only communications between a user and a relay CA.

Finally, we support making block mode available to RTT users, and encourage the FCC to expedite research in the area of RTT and refreshable Braille displays. We also stress the need for a clear, coordinated, and accurate public education process involving both the FCC and the Department of Justice to ensure that deaf and hard of hearing consumers are not harmed as a result of this transition process, and as business and government entities try to understand the change in requirements and how it impacts their provision of reasonable accommodations.

II. Metrics regarding RTT backward compatibility with TTY (FNPRM ¶76)

We offer the following comments with regard to the FNPRM's request for "comment on the type of data and metrics that can be used to monitor the availability, adoption, and acceptance of RTT services and devices."[3]

A. Areas with no RTT support for 9-1-1 calls

The most important metrics to consider when determining a sunset deadline for backward compatibility is the number of areas that are not supported by any RTT-capable connection on the emergency service network side. The TTY interoperability requirement should not sunset as long as there are areas where the only way to carry out a text based emergency call is by TTY. These metrics could be collected yearly, similar to how information regarding text-to-9-1-1 deployment is currently collected. The interoperability requirement should not sunset until there are no longer any areas that solely rely on TTY for text-based emergency calls. Note that if certain

[3] FNPRM at ¶76.

PSAPs move early to NG9-1-1 with RTT support and would be prepared to accept RTT calls for areas wider than their original responsibility area for voice calls, then this process could be expedited.

B. Metrics of RTT deployment rate

The deployment rate of RTT discussed in paragraph 76 of the NPRM is necessary for assessing the efforts of the wireless carriers to provide attractive and accessible RTT solutions. Reporting should be required for all entities that are or will eventually be subject to the RTT requirements. This reporting should be undertaken at least yearly. Such a requirement would not overburden reporting parties or the FCC, and would still provide sufficient information for the various assessments that are of interest from this material.

One key figure needed for assessing the continuation of backward compatibility is the numbers of calls actually using text transmission between RTT and TTY. A relation of this figure to the number of RTT calls and the total number of calls for the carrier would also be of value.

Another piece of valuable information for reporting would be information concerning RTT support in the network, and a comparison of the number of provided handset models with and without RTT support.

An important factor in RTT supplanting TTYs is ensuring that all users, including those who are accustomed to TTY but not mobile devices, are able to use RTT. This includes, for example, ensuring the availability of devices such as a conveniently sized external physical keyboard for rapid RTT communication and suitable arrangements for convenient display of the dialogue when using the external keyboard. Generally, RTT should be accessible to those who

are used to the ease of operation that TTYs have long provided. These factors should be included in the reporting requirements. The keyboard aspect of this reporting would be simple if devices are designed to support standard Bluetooth keyboards, as well as hardwired keyboards where technically possible, for use with RTT, in which case there will always be a broad range of external keyboards available for this purpose. Another important part of ensuring that RTT is usable by TTY users with no familiarity with mobile devices, described more below, is enabling wireline users to utilize RTT. The familiarity aspect is especially critical for older adults and people with intellectual disabilities that may prevent them from learning a new, unfamiliar, and more complex user interface than what the TTY offers. This is underscored by Pew studies that have consistently reported that older adults lag in adoption of new technologies, including new wireless technologies.[4] To ensure that they are not left behind, it is critical that they have access to a TTY replacement that is equally simple to use, and does not require them to learn something new.

III. Other factors for deciding the TTY interoperability sunset date (FNPRM ¶77)

We reiterate that the sunset date must depend on maximum support for RTT in 9-1-1 calls. Any plan to set a date needs to be coordinated with the plan to provide RTT support in 9-1-1 access. We caution that setting a specific sunset date at this time is premature, as there can be no assurances of how the RTT landscape will look at a specific date in the future. It therefore makes more sense to sunset interoperability requirements when the infrastructure has completely migrated to IP-based signalling. Setting a premature date could cause harm to services and consumers, including diminishing access to emergency communication. If the Commission is

[4] *See* e.g., Aaron Smith, *Older Adults and Technology Use*, Pew Research Center, Apr. 3, 2014, http://www.pewinternet.org/2014/04/03/older-adults-and-technology-use/.

inclined to set a specific date, it should refrain from doing so until it has the opportunity to reassess the RTT landscape at the sunset of the PSTN and the transition of all consumers to IP-based wireline and wireless networks.

Another factor that needs to be considered is the opportunity for wireline users to move to RTT and to have access to terminals that meet the criteria described at the end of Section II.B. As explained there, one important reason for requiring TTY interoperability support is that there are TTY users in the wireline network who see no realistic alternatives to the TTY. So, once suitable wireline RTT support requirements are in place everywhere and supported by suitable services and equipment that really can replace TTYs, then a sunset date can be considered, taking all of these factors into account.

The actual number of TTY users in the wireline and wireless networks would need to be at or near zero on the sunset date in order for it to be manageable for carriers to support the remaining TTY users' move to RTT alternatives, assuming affordable IP connections are available to those TTY users (since if they must stay on analog, there is no other solution except TTYs).

At the eventual sunset date for TTY, any carrier that has a PSTN customer who is still using TTY instead of RTT and who is in need of real-time conversation by text, could be required to provide RTT and an IP connection suitable for at least one RTT call including voice to the earlier TTY user at a cost for the user that is not higher than for the PSTN connection.

IV. RTT support in TRS (FNPRM ¶¶78-82)

We cannot emphasize strongly enough the importance of integrating RTT into TRS. Paragraph 81 of the FNPRM recognizes this importance. However, we urge the Commission to

more pointedly recognize the benefits and needs of requiring RTT integration with TRS and adaption to the RTT level of functionality in the TRS services. As already seen in other countries, RTT access to TRS provides a revolution in functionality compared to access by TTY or other forms of PSTN text telephones. The speed, the mobility and the true simultaneous voice and text capability makes RTT access to TRS a necessary and urgent step to better accessibility. There is no doubt that RTT should be integrated with TRS in order to improve the usability of TRS, as has been done in countries like Sweden, Holland and France.

Paragraph 80 of the FNPRM indicates that there is some confusion regarding RTT to RTT calls and RTT supported TRS calls. It is obvious that RTT to RTT calls can reduce the load on TRS for cases when both users can conveniently operate RTT in their current situation. The opportunity for such load reduction is higher the more availability there is for the general public to have RTT capable equipment, and RTT enabled by default. But it is equally obvious that there still will be situations when one party in the call will only have the option to use voice or sign language and the other only RTT, and therefore a TRS service will be needed to mediate the call. As a summary: RTT is needed for both RTT to RTT calls and TRS access. TRS is needed for RTT to voice calls and RTT to sign language calls (the latter by chaining TRS with VRS).

V. RTT TRS mandates and requirements to meet minimum standards (FNPRM ¶83)

Whatever approach the Commission takes toward a mandated versus voluntary approach to providing RTT in the TRS ecosystem, it is critical that the decision allows clear functional requirements for TRS to be placed on carriers and TRS providers, such as speed of answer, typing speeds, confidentiality, and all the other typical TRS requirements. At the same time, RTT offers better functionality than TTYs and the mechanisms for providing TRS need to be

flexible enough to allow full support of the technical innovations that RTT brings, which could result in improved functional TRS performance characteristics.

Integrating RTT into the TRS ecosystem needs to be mindful of emergency calling issues. Specifically, calling 9-1-1 in an emergency and not requesting any TRS invocation will be the correct action by an RTT user in an emergency. There will, however, always be a risk that the RTT user will call 711 in an emergency, either out of habit or because the user does not expect that the 9-1-1 service will handle RTT calls.

If the caller calls 711 and subsequently requests a connection to 9-1-1, the opportunities for proper handling of the call are low. IP devices need to "know" when they make 9-1-1 calls in order to take certain actions, such as including a location and calling a special Universal Resource Number (URN) instead of the 911 number. All of that will be initially missed if the user calls 711. However, requesting the user to hang up and call 9-1-1 instead may cause stress and delays. The technical specifications in NENA NG9-1-1 I3 (STA-010) describe a way for the TRS to refer the call back to the user terminal to automatically convert the call to a direct 9-1-1 call. This procedure should be considered and if found possible to implement reliably, it should be required that 711 relay services apply it, and that user endpoints, including those distributed by TRS providers, support it.

When the model for direct calling (described in our comments responding to paragraph 86 of the FNPRM below) is implemented and used by the calling RTT user in an emergency, then the TRS and the 9-1-1 service are both connected to the call. In such cases, the TRS can just stay on the line and make sure that the call between the PSAP and the user flows as intended. After that, the TRS should release its connection to the call. If by any reason the PSAP and the RTT user are not able to communicate as intended, the TRS can stay on the call and provide its

service. Note that this approach would align with the Media Communication Line Services concept proposed by the FCC Emergency Access Advisory Committee.

Further investigation of this topic is recommended. ETSI has published standards documents about NG emergency services and the combination of relay services and RTT capable terminals. They could be consulted for guidance, specifically ETSI TS 101 470 and ETSI TR 103 201.

Where minimum mandatory standards for RTT based TRS are concerned, some of these are not applicable to RTT-based TRS if it is implemented according to our comments on paragraph 86 of the FNPRM below, where we propose a direct calling-based model. In this case, the TRS requirement to handle sequential calls would no longer apply, as the user would call the other party's ten-digit number directly. The two line HCO requirement would not be applicable either, since voice and text can be freely intermixed and transmitted simultaneously on RTT calls. The call release function is valuable both for the user and for the economy of providing the TRS services and should therefore be maintained also for RTT-based TRS.

VI. Timing of RTT TRS requirements (FNPRM ¶84)

Wireless providers should be allowed to stop providing TTY access to TRS as soon as they have RTT based TRS ready.

There is no relation between wireline RTT provision and RTT-based TRS provision to wireless users.

VII. Assumptions on relations between RTT and various TRS (FNPRM ¶85)

We agree that RTT should not be considered a replacement for TRS, and that it is important for users of non-text-based TRS to continue to have access to these important services.

VIII. Functions required to make RTT-based TRS accessible (FNPRM ¶86)

There are important factors that could serve as minimum standards for RTT-based TRS. Initially, a model like the current 711 calling model could be used while TRS providers implement a call routing architecture that supports both RTT for direct calls and RTT through TRS, as described below.

In the 711 calling model, calls are made in two steps. First the user calls 711. Second, once connected with 711, the user then communicates to the CA where the call should be connected.

However, this two-step calling model has severe limitations. For example, it is difficult for a TRS user to explain to a hearing voice phone user how to place calls to such 711 TRS users. As a result, very few TRS calls between a hearing user and a TRS user are initiated by the hearing user. There are also many phone-based services, as well as websites, online stores, etc., where a user is required to enter a telephone number to be called back on in order to receive the requested service. Such services are inaccessible for 711 TRS users. This problem is overcome in the other TRS variants that support direct 10-digit calling. In VRS and IP-Relay, the users have regular phone numbers and calls can be made in one step. A call via these services to voice telephone users includes a calling line identification number that can be used for calling back the user, which includes the relay service automatically. The callers also include the final destination number when they call, allowing the relay service to set up the whole call chain. These functions are very important and make one-step calling supported relay calls much closer to being accessible than the 711 calling model. Note that IP-CTS also allows direct calling of ten-digit numbers, and the users invoke captions on demand on their terminal.

The desirable model for RTT-based TRS is that the users make and receive calls directly from their number in one step. This model also works best when the mainstream carrier, which provides the RTT-capable terminals to the general public as well as to the TRS users, is also the carrier of the RTT TRS users. This is akin to how IP-CTS ten-digit numbers are handled through the phone carriers, and distinct from VRS and IP-Relay, where the relay service provider acts as the "carrier" for ten-digit numbers.

We do not believe that the VRS and IP-Relay model of calling ten-digit numbers directly is workable for all the use cases that involve RTT through TRS. In particular, in the VRS service model, there is a database with phone numbers of users of the VRS services. When a call is made, the service checks to see if the calling number or the called number is represented in the data base. If both are found, the call is made directly without invoking the communications agent to mediate the call. If just one of the numbers is found, a sign language interpreter is included in the call to make the required translation.

This simple VRS and IP-Relay decision model will not hold for the RTT TRS users. Assuming that Captioned Telephony Services (CTS) will be included among the services provided to RTT users, we will have at least the following call types:

1. Call between RTT users prepared to use text in both directions optionally combined with voice;
2. Call between RTT-only user and voice user, where the voice user is prepared to use text in one or both directions because they have an RTT capable terminal;
3. Call with RTT user of CTS or regular TRS, only prepared to use received text (e.g. captions) but requires that the user speaks;

4. Call with RTT user only prepared to send text but requires hearing the other party's voice (e.g. person with speech impairment);
5. Call with voice-only in the PSTN;
6. Call with voice-only in the wireless networks;
7. Call to RTT capable terminal, but with a hearing user who is unable to use text at the moment, even though they would use RTT in other situations;
8. Call with TTY in the PSTN, when an RTT/TTY gateway is needed in the call; and
9. Call with 9-1-1 requiring use of RTT or a combination of RTT and voice.

These variations introduce situations when two relay services may be involved in the call. This is the case when one CTS user calls another CTS user by RTT-capable terminals. If both users are prepared to type, they can have a direct RTT conversation in text, possibly complemented with voice. But if one or both users are not prepared to type their conversation, one CTS service needs to be invoked for each user.

This is also the case with a call from a TTY or a voice user without a TTY in PSTN to an RTT user. The TTY calls are not marked as TTY calls in any way, but are made as any other voice call initially. The answering RTT user may request activation of RTT. The call can then turn out to be a call where an RTT/TTY gateway can be invoked and allow the TTY user and the RTT user to communicate directly by text possibly complemented by voice. But the call can also turn out to be from a calling voice user. When the answering RTT user activates RTT, it would mean that an RTT-based TRS is needed in the call.

Some of these described use cases preclude using a simple automated decision-making process as to whether to involve TRS or an RTT/TTY gateway. Because the VRS and IP-Relay model depends on such an automated decision making process, it follows that ten-digit numbers

need to be assigned through the user's phone carriers, instead of the TRS providers, and that decisions about involving TRS need to be left to the user, as described below.

It is more realistic to introduce manual invocation of TRS service in calls with RTT users than to make automatic invocation. This is akin to how IP-CTS services are invoked and released at the press of a button. In many cases, the users will have an expectation of what kind of call it will be when they make or receive the call. An opportunity to manually indicate that a favored type of TRS is needed for the call would lead to a satisfactory service provision in many cases. For cases where the TRS is not initially included but turns out to be needed, an opportunity to manually add TRS during the call will be desirable. For cases where the TRS is included but not needed, an opportunity to manually disconnect the TRS during the call ("call release") will be desirable.

We recommend an architecture where the RTT-based TRS user initiates and receives the call directly to or from the other party in the call and the user has an opportunity to indicate if a relay service is needed in the call, and if so, the terminal takes the necessary actions to invoke the TRS on one leg of a three-party call. The three-party connection can be made in the terminal, as an additional service in the carrier's network, or through an application service.

The timeline for RTT-based TRS should give the TRS 12 months for implementation for 7-1-1-based RTT TRS support. This will entail, at a minimum, providing endpoints to TRS users that are capable of handling RTT calls, and managing TTY backward-compatibility with TRS. For the full architecture we propose above, which will result in drastically better usability and functional equivalence, the carriers and TRS providers should be given 24 months.

For assessing influence on TRS usage by RTT-based TRS, user statistics should be collected. These should include the type of service (TTY vs RTT vs CTS) and the type of

network (wireless, PSTN, wireline VoIP). User studies and analysis should also be performed with specific questions about RTT and TRS usage.

We also wish to emphasize that all forms of TRS need to take steps to ensure RTT support in both their networks and terminals, and that it should be based on the RFC 4103 safe harbor standard. The VRS interoperability specifications already include this; IP-Relay and IP-CTS should follow suit. If RTT and RTT interoperability is pervasive across the entire TRS ecosystem, it opens up more opportunities for direct calling and reducing the pressure on the TRS fund. For example, video calls with receiving RTT typed back would become feasible without relay involvement, where both sides know ASL but one side is deafblind, and requires text typed back. It also would support the call scenario outlined above where a CTS user makes a call to an RTT user on their regular terminal, and receives text typed back, instead of invoking the relay. Finally, support for the RTT safe harbour standard in CTS would allow for use of the native wireless RTT functionality in making calls, which, with the proposed architecture, also has the potential to improve wireless CTS usability – the current wireless IP-CTS call setup mechanism is still complicated.

In all TRS use cases, we strongly encourage making RTT available to all parties in the conversation where supported by the networks and terminal, and not restricting it to only communications between a user and a relay CA. For example, in a CTS call, if the hearing party were able to see the captions of what is spoken, it may be possible to spot and correct miscommunications much more quickly – through speaking or through typing – than if a misunderstanding became clear only much later. This particular scenario is feasible only if all sides can send and receive RTT.

IX. RTT and refreshable Braille displays (FNPRM ¶88)

RTT is used with refreshable Braille displays. The FNPRM identifies some concerns in paragraph 88 about use of refreshable Braille displays for specific users, including that, in some cases, it can be disturbing for the reader if the display is updated for each received character, and especially if the effect is that a whole line is refreshed by display of each new character. We note that one possible solution could be that real-time display is temporarily held until a certain condition is fulfilled. If it is not expected to be sufficient to wait for market forces to cause refinement of the implementations, specific actions can be initiated to make sure that refined solutions are available when the first wireless RTT solutions are launched. The National Deaf-Blind Equipment Distribution Program may include an opportunity to encourage such developments. We also encourage the FCC to expedite research in this area, including, for example, by assigning a Disability Advisory Committee working group to consider these issues.

X. Block mode (FNPRM ¶89)

Block mode is primarily intended to aid particular users with specific needs (such as users who make a large number of typos and need time to correct them), and to enable all users to copy and correct text, when needed. Another application is for 9-1-1 telecommunicators to type out instructions in full before transmitting them, so as not to cause misunderstandings due to partially transmitted text. For these reasons, we support making block mode available to users.

XI. Public Education

Finally, we stress the need for a clear, coordinated, and accurate public education process involving both the FCC and the Department of Justice to ensure that deaf and hard of hearing consumers are not harmed as a result of this transition process, and as business and government

entities try to understand the change in requirements and how it impacts their provision of reasonable accommodations.

Respectfully submitted,

/s/
Christian Vogler, Ph.D.
Director, DHH-RERC
Director, Technology Access Program
Gallaudet University
christian.vogler@gallaudet.edu

Gregg C. Vanderheiden, Ph.D.
Director, UIITA-RERC
Director, Trace R&D Center
University of Maryland, College Park
GreggVan@umd.edu

Gunnar Hellström
Omnitor
Box 92054 120 06 Stockholm Sweden
gunnar.hellstrom@omnitor.se

Telecommunications for the Deaf and Hard of Hearing, Inc. (TDI)
Claude Stout, Executive Director • cstout@TDIforAccess.org
8630 Fenton Street, Suite 121, Silver Spring, MD 20910
TDIforAccess.org

National Association of the Deaf (NAD)
Howard Rosenblum, Chief Executive Officer • howard.rosenblum@nad.org
Contact: Zainab Alkebsi, Policy Counsel • zainab.alkebsi@nad.org
8630 Fenton Street, Suite 820, Silver Spring, MD 20910
nad.org

Hearing Loss Association of America (HLAA)
Barbara Kelley, Executive Director • bkelley@hearingloss.org
Lise Hamlin, Director of Public Policy • lhamlin@hearingloss.org
7910 Woodmont Avenue, Suite 1200, Bethesda, MD 20814
hearingloss.org

February 22, 2017